Examiner's reference (1)

4 ANSWER 3 OF 5 BIOSIS COPYRIGHT 2001 BIOSIS
AN 1994:531023 BIOSIS
DN PREV199497544023
TI Strain selection, taxonomy, and genetics of xylose-fermenting yeasts.
AU Jeffries, T. W. (1); Kurtzman, C. P.
CS (1) Forest Prod. Lab., U.S. Dep. Agric., Forest Serv., Madison, WI 53705 USA
SO Enzyme and Microbial Technology, (1994) Vol. 16, No. 11, pp. 922-932. ISSN: 0141-0229.
DT General Review
LA English
AB Xylose utilization is essential for the efficient conversion of lignocellulose to ethanol. The objective of this review is to trace the development of **xylose-fermenting yeast** strains from their discovery in 1980. Following initial reports, screens of known yeasts identified five species of interest: Candida shehatae, Candida tenuis, Pachysolen tannophilus, Pichia segobiensis, and Pichia stipitis. Candida shehatae strains can be divided into three varieties. Pachysolen tannophilus and Pichia stipitis have been studied most extensively and have the best-understood genetic systems. Improved mutants of P. tannophilis have been obtained by selecting for an inability to oxidize ethanol (eth) and for rapid growth on xylitol and nitrate. Improved P. stipitis mutants have been obtained by selecting for flocculation, decreased utilization of glucose, and growth on noninductive carbon sources. Bacterial xylose isomerase has been cloned and expressed in **S. cerevisiae** and Schizosaccharomyces pombe, but the heterologous enzyme is inactive. Xylose reductase and xylitol dehydrogenase have been cloned from P. stipitis and expressed in Saccharomyces cerevisiae, giving rise to transformant **S. cerevisiae** that grow on xylose but that ferment it poorly. A transformation and expression system based on the URA3 marker has recently been developed for P. stipitis so that contemporary genetic methods may be brought to bear on this organism.
CC General Biology - Taxonomy, Nomenclature and Terminology *00504
General Biology - Conservation, Resource Management *00512
Cytology and Cytochemistry - Plant *02504
Genetics and Cytogenetics - Plant *03504
Comparative Biochemistry, General *10010
Biochemical Methods - General *10050
Biochemical Methods - Carbohydrates *10058
Biochemical Studies - General *10060
Biochemical Studies - Proteins, Peptides and Amino Acids *10064
Biochemical Studies - Carbohydrates *10068
Biophysics - Molecular Properties and Macromolecules *10506
Enzymes - General and Comparative Studies; Coenzymes *10802
Enzymes - Methods *10804
Enzymes - Chemical and Physical *10806
Enzymes - Physiological Studies *10808
Metabolism - General Metabolism; Metabolic Pathways *13002
Metabolism - Energy and Respiratory Metabolism *13003
Metabolism - Carbohydrates *13004
Nutrition - Carbohydrates *13220
Food and Industrial Microbiology - Biosynthesis, Bioassay and Fermentation *39007
Botany, General and Systematic - Fungi *50506

L4 & L6

Plant Physiology, Biochemistry and Biophysics - Nutrition *51504
Plant Physiology, Biochemistry and Biophysics - Respiration, Fermentation *51508
Plant Physiology, Biochemistry and Biophysics - Growth, Differentiation *51510
Plant Physiology, Biochemistry and Biophysics - Enzymes *51518
Plant Physiology, Biochemistry and Biophysics - Metabolism *51519

BC Fungi - Unspecified *15000

IT Major Concepts
Biochemistry and Molecular Biophysics; Bioenergetics (Biochemistry and Molecular Biophysics); Bioprocess Engineering; Cell Biology; Conservation; Development; Enzymology (Biochemistry and Molecular Biophysics); General Life Studies; Genetics; Metabolism; Methods and Techniques; Nutrition; Systematics and Taxonomy

IT Chemicals & Biochemicals
ETHANOL; ALCOHOL; XYLOSE; CELLULOSE

IT Industry
biotechnology industry

IT Miscellaneous Descriptors
ALCOHOL PRODUCTION; CELLULOSE CONVERSION; ENZYMES; ETHANOL PRODUCTION; FERMENTATION; GENETIC METHODS; GROWTH; NUTRITION; XYLOSE UTILIZATION

ORGN Super Taxa
Fungi - Unspecified: Fungi, Plantae

ORGN Organism Name
fungi (Fungi - Unspecified); fungus (Fungi - Unspecified)

ORGN Organism Superterms
fungi; microorganisms; nonvascular plants; plants

RN 64-17-5 (ETHANOL)
64-17-5 (ALCOHOL)
58-86-6Q (XYLOSE)
25990-60-7Q (XYLOSE)
9004-34-6 (CELLULOSE)

examiner's ref.

L9 ANSWER 12 OF 12 CAPLUS COPYRIGHT 2001 ACS
AN 1983:124199 CAPLUS
DN 98:124199
TI Direct fermentation of D-xylose to ethanol by a **xylose-fermenting yeast** mutant
IN Gong, Cheng Shung
PA Purdue Research Foundation, USA
SO Eur. Pat. Appl., 21 pp.
CODEN: EPXXDW
DT Patent
LA English
IC C12P007-06
CC 16-5 (Fermentation and Bioindustrial Chemistry)
FAN.CNT 1

| | PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|---|
| PI | EP 66396 | A1 | 19821208 | EP 1982-302474 | 19820514 |
| | EP 66396 | B1 | 19850821 | | |
| | R: AT, BE, CH, DE, FR, GB, IT, LU, NL, SE | | | | |
| | US 4368268 | A | 19830111 | US 1981-263925 | 19810515 |
| | US 4511656 | A | 19850416 | US 1982-376731 | 19820511 |
| | WO 8204068 | A1 | 19821125 | WO 1982-US642 | 19820513 |
| | W: AU, BR, DK, FI, JP, NO | | | | |
| | AU 8285859 | A1 | 19821207 | AU 1982-85859 | 19820513 |
| | ZA 8203350 | A | 19830629 | ZA 1982-3350 | 19820514 |
| | AT 15073 | E | 19850915 | AT 1982-302474 | 19820514 |
| | CA 1207257 | A1 | 19860708 | CA 1982-402984 | 19820514 |
| PRAI | US 1981-263925 | | 19810515 | | |
| | US 1982-376731 | | 19820511 | | |
| | WO 1982-US642 | | 19820513 | | |
| | EP 1982-302474 | | 19820514 | | |

AB EtOH [64-17-5] is produced from D-xylose [58-86-6] or hemicellulose hydrolyzate by Candida or Saccharomyces cerevisiae mutants. Thus, **S. cerevisiae** ATCC 20618 was inoculated into pH 5.6 YM medium contg. 5% xylose and incubated at 30.degree. for 48 h with shaking.
The concn. of EtOH was 1.41%.
ST Saccharomyces ethanol fermn xylose hemicellulose; Candida ethanol fermn xylose hemicellulose; yeast ethanol fermn xylose hemicellulose
IT Candida
(ethanol manuf. from hemicellulose hydrolyzate and xylose with)
IT Saccharomyces cerevisiae
(ethanol manuf. from xylose with)
IT Fermentation
(ethanol, of hemicellulose hydrolyzate and xylose with yeast)
IT 58-86-6, biological studies 9034-32-6D, hydrolyzates
RL: BIOL (Biological study)
(ethanol manuf. from, by yeast)
IT 64-17-5P, preparation
RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP (Preparation)
(manuf. of, from xylose by yeast)

[redacted]

L6 ANSWER 1 OF 2 BIOSIS COPYRIGHT 2001 BIOSIS
AN 1994:531023 BIOSIS
DN PREV199497544023
TI Strain selection, taxonomy, and genetics of xylose-fermenting yeasts.
AU Jeffries, T. W. (1); Kurtzman, C. P.
CS (1) Forest Prod. Lab., U.S. Dep. Agric., Forest Serv., Madison, WI 53705 USA
SO Enzyme and Microbial Technology, (1994) Vol. 16, No. 11, pp. 922-932. ISSN: 0141-0229.
DT General Review
LA English
AB Xylose utilization is essential for the efficient conversion of lignocellulose to ethanol. The objective of this review is to trace the development of **xylose-fermenting** yeast strains from their discovery in 1980. Following initial reports, screens of known yeasts identified five species of interest: Candida shehatae, Candida tenuis, Pachysolen tannophilus, Pichia segobiensis, and Pichia stipitis. Candida shehatae strains can be divided into three varieties. Pachysolen tannophilus and Pichia stipitis have been studied most extensively and have the best-understood genetic systems. Improved mutants of P. tannophilis have been obtained by selecting for an inability to oxidize ethanol (eth) and for rapid growth on xylitol and nitrate. Improved P. stipitis mutants have been obtained by selecting for flocculation, decreased utilization of glucose, and growth on noninductive carbon sources. Bacterial xylose isomerase has been cloned and expressed in S. cerevisiae and **Schizosaccharomyces pombe**, but the heterologous enzyme is inactive. Xylose reductase and xylitol dehydrogenase have been cloned from P. stipitis and expressed in Saccharomyces cerevisiae, giving rise to transformant S. cerevisiae that grow on xylose but that ferment it poorly. A transformation and expression system based on the URA3 marker has recently been developed for P. stipitis so that contemporary genetic methods may be brought to bear on this organism.
CC General Biology - Taxonomy, Nomenclature and Terminology *00504
General Biology - Conservation, Resource Management *00512
Cytology and Cytochemistry - Plant *02504
Genetics and Cytogenetics - Plant *03504
Comparative Biochemistry, General *10010
Biochemical Methods - General *10050
Biochemical Methods - Carbohydrates *10058
Biochemical Studies - General *10060
Biochemical Studies - Proteins, Peptides and Amino Acids *10064
Biochemical Studies - Carbohydrates *10068
Biophysics - Molecular Properties and Macromolecules *10506
Enzymes - General and Comparative Studies; Coenzymes *10802
Enzymes - Methods *10804
Enzymes - Chemical and Physical *10806
Enzymes - Physiological Studies *10808
Metabolism - General Metabolism; Metabolic Pathways *13002
Metabolism - Energy and Respiratory Metabolism *13003
Metabolism - Carbohydrates *13004
Nutrition - Carbohydrates *13220
Food and Industrial Microbiology - Biosynthesis, Bioassay and Fermentation *39007
Botany, General and Systematic - Fungi *50506
Plant Physiology, Biochemistry and Biophysics - Nutrition *51504
Plant Physiology, Biochemistry and Biophysics - Respiration, Fermentation *51508

Plant Physiology, Biochemistry and Biophysics - Growth, Differentiation *51510
Plant Physiology, Biochemistry and Biophysics - Enzymes *51518
Plant Physiology, Biochemistry and Biophysics - Metabolism *51519
BC Fungi - Unspecified *15000
IT Major Concepts
Biochemistry and Molecular Biophysics; Bioenergetics (Biochemistry and Molecular Biophysics); Bioprocess Engineering; Cell Biology; Conservation; Development; Enzymology (Biochemistry and Molecular Biophysics); General Life Studies; Genetics; Metabolism; Methods and Techniques; Nutrition; Systematics and Taxonomy
IT Chemicals & Biochemicals
ETHANOL; ALCOHOL; XYLOSE; CELLULOSE
IT Industry
biotechnology industry
IT Miscellaneous Descriptors
ALCOHOL PRODUCTION; CELLULOSE CONVERSION; ENZYMES; ETHANOL PRODUCTION; FERMENTATION; GENETIC METHODS; GROWTH; NUTRITION; XYLOSE UTILIZATION
ORGN Super Taxa
Fungi - Unspecified: Fungi, Plantae
ORGN Organism Name
fungi (Fungi - Unspecified); fungus (Fungi - Unspecified)
ORGN Organism Superterms
fungi; microorganisms; nonvascular plants; plants
RN 64-17-5 (ETHANOL)
64-17-5 (ALCOHOL)
58-86-6Q (XYLOSE)
25990-60-7Q (XYLOSE)
900

L4 ANSWER 1 OF 5 BIOSIS COPYRIGHT 2001 BIOSIS
AN 1996:75338 BIOSIS
DN PREV199698647473.
TI Xylulose fermentation by Saccharomyces cerevisiae and **xylose-fermenting yeast** strains.
AU Yu, S.; Jeppsson, H.; Hahn-Hagerdal, B. (1)
CS (1) Dep. Applied Microbiology, Chemical Centre, Lund Inst. Technol., Univ.
Lund, P.O. Box 124, S-22100 Lund Sweden
SO Applied Microbiology and Biotechnology, (1995) Vol. 44, No. 3-4, pp. 314-320.
ISSN: 0175-7598.
DT Article
LA English
AB Xylulose fermentation by four strains of Saccharomyces cerevisiae and two strains of xylose-fermenting yeasts, Pichia stipitis CBS 6054 and Candida shehatae NJ 23, was compared using a mineral medium at a cell concentration of 10 g (dry weight)/l. When xylulose was the sole carbon source and fermentation was anaerobic, **S. cerevisiae** ATCC 24860 and CBS 8066 showed a substrate consumption rate of 0.035 g g cells-1 h-1 compared with 0.833 gg cells-1h-1 for glucose. Bakers' yeast and **S. cerevisiae** isolate 3 consumed xylulose at a much lower rate although they fermented glucose as rapidly as the ATCC and the CBS strains. While P. stipitis CBS 6054 consumed both xylulose and glucose very slowly under anaerobic conditions, C. shehatae NJ 23 fermented xylulose at a rate of 0.345 gg cells-1h-1, compared with 0.575 gg cells-1 h-1 for glucose. For all six strains, the addition of glucose to the xylulose medium did not enhance the consumption of xylulose, but increased the cell biomass concentrations. When fermentation was performed under oxygen-limited conditions, less xylulose was consumed by **S. cerevisiae** ATCC 24860 and C. shehatae NJ 23, and 50%-65% of the assimilated carbon could not be accounted for in the products determined.
CC Cytology and Cytochemistry - Plant *02504
Comparative Biochemistry, General *10010
Biochemistry - Gases *10012
Biochemical Methods - General *10050
Biochemical Studies - General *10060
Biochemical Studies - Carbohydrates *10068
Metabolism - General Metabolism; Metabolic Pathways *13002
Metabolism - Energy and Respiratory Metabolism *13003
Metabolism - Carbohydrates *13004
Nutrition - Carbohydrates *13220
Microbiological Apparatus, Methods and Media *32000
Food and Industrial Microbiology - Biosynthesis, Bioassay and Fermentation *39007
Food and Industrial Microbiology - General and Miscellaneous *39008
Plant Physiology, Biochemistry and Biophysics - Nutrition *51504
Plant Physiology, Biochemistry and Biophysics - Respiration, Fermentation *51508
Plant Physiology, Biochemistry and Biophysics - Growth, Differentiation *51510
Plant Physiology, Biochemistry and Biophysics - Metabolism *51519
Plant Physiology, Biochemistry and Biophysics - Apparatus and Methods *51524
BC Ascomycetes 15100
Fungi Imperfecti or Deuteromycetes *15500

LH

[redacted]

IT Major Concepts
Biochemistry and Molecular Biophysics; Bioenergetics (Biochemistry and Molecular Biophysics); Bioprocess Engineering; Cell Biology; Development; Metabolism; Methods and Techniques; Nutrition
IT Chemicals & Biochemicals
XYLULOSE; ALCOHOL; CARBON
IT Miscellaneous Descriptors
ALCOHOL PRODUCTION; BIOTECHNOLOGY; CARBON ASSIMILATION; CARBON SOURCE; CELL BIOMASS; MEDIA; METABOLISM; METHODS; SUGAR CONSUMPTION RATES
ORGN Super Taxa
Ascomycetes: Fungi, Plantae; Fungi - Unspecified: Fungi, Plantae; Fungi
Imperfecti or Deuteromycetes: Fungi, Plantae
ORGN Organism Name
fungus (Fungi - Unspecified); Candida shehatae (Fungi Imperfecti or Deuteromycetes); Pichia stipitis (Ascomycetes); Saccharomyces cerevisiae (Ascomycetes)
ORGN Organism Superterms
fungi; microorganisms; nonvascular plants; plants
RN 551-84-8Q (XYLULOSE)
5962-29-8Q (XYLULOSE)
64-17-5 (ALCOHOL)
7440-44-0 (CARBON)

L4 ANSWER 4 OF 5 BIOSIS COPYRIGHT 2001 BIOSIS
AN 1993:250914 BIOSIS
DN PREV199395130089
TI Cofermentation of glucose and xylose to ethanol by a respiratory-deficient mutant of Saccharomyces cerevisiae co-cultivated with a **xylose-fermenting yeast**.
AU Laplace, Jean M.; Delgenes, Jean P. (1); Moletta, Rene; Navarro, Jean M.
CS (1) Institut National Recherche Agronomique, Laboratoire Biotechnol. Environnement IAA, Boulevard General de Gaulle, 11100 Narbonne France
SO Journal of Fermentation and Bioengineering, (1993) Vol. 75, No. 3, pp. 207-212.
ISSN: 0922-338X.
DT Article
LA English
AB As a part of the alcoholic conversion of lignocelluloses, fermentation of a glucose-xylose mixture by a coculture process was investigated in oxygen-limited conditions. In batch mixed cultures of Saccharomyces cerevisiae CBS 1200 and Candida shehatae ATCC 22984, ethanol was produced only from glucose. During the fermentation by **S. cerevisiae** consuming glucose, the fermentation and growth activities of the **xylose-fermenting yeast** were extremely low, although an optimal condition of oxygen transfer rate in the co-culture was used. The use of a repiratory-deficient mutant of **S. cerevisiae** CBS 1200 allows significant cell growth of C. shebatae in a batch culture under a favourable oxygen condition. The growth of C. shehatae, however, results in the utilization of glucose, due to the catabolic repression of glucose on the xylose consumption. When the two yeast strains were co-cultivated in a continuous culture, the simultaneus conversion of glucose and xylose was obtained: conversion yields of glucose and xylose were respectively 100% and 27% of a diffusion rate of 0.02 h-1. When the mutant of **S. cerevisiae** was co-cultivated with Pichia stipitis NRRL. Y11545, a rapid **xylose-fermenting yeast**, the co-fermentation of glucose and xylem was enhanced: ethanol was produced with a yield of 0.42 g of ethanol/g of consumed sugars and the respective yields of glucose and xylose conversions were 100% and 69% of the tested dilution rate of 0.02 h-1. The advantages of the co-cultivation of a respiratory-deficient mutant of hexose-fermenting and a **xylose-fermenting yeast** are discussed.
CC Cytology and Cytochemistry - Plant *02504
Genetics and Cytogenetics - Plant *03504
Comparative Biochemistry, General 10010
Biochemistry - Gases *10012
Biochemical Methods - General 10050
Biochemical Methods - Carbohydrates 10058
Biochemical Studies - General *10060
Biochemical Studies - Carbohydrates *10068
Biophysics - General Biophysical Studies 10502
Metabolism - General Metabolism; Metabolic Pathways *13002
Metabolism - Energy and Respiratory Metabolism *13003
Metabolism - Carbohydrates *13004
Nutrition - General Studies, Nutritional Status and Methods 13202
Nutrition - Carbohydrates 13220
Microbiological Apparatus, Methods and Media 32000
Food and Industrial Microbiology - Biosynthesis, Bioassay and Fermentation

*39007
Plant Physiology, Biochemistry and Biophysics - Nutrition 51504
Plant Physiology, Biochemistry and Biophysics - Respiration, Fermentation *51508
Plant Physiology, Biochemistry and Biophysics - Metabolism *51519
Plant Physiology, Biochemistry and Biophysics - Chemical Constituents 51522
Plant Physiology, Biochemistry and Biophysics - Apparatus and Methods 51524
Plant Physiology, Biochemistry and Biophysics - General and Miscellaneous *51526

BC Ascomycetes 15100
Fungi Imperfecti or Deuteromycetes *15500

IT Major Concepts
Biochemistry and Molecular Biophysics; Bioenergetics (Biochemistry and Molecular Biophysics); Bioprocess Engineering; Cell Biology; Genetics; Metabolism; Physiology

IT Chemicals & Biochemicals
GLUCOSE; XYLOSE; ETHANOL; OXYGEN

IT Industry
biotechnology industry

IT Miscellaneous Descriptors
DILUTION RATE; FERMENTATION; GENETICS; METHODS; OXYGEN TRANSFER RATE; RESPIRATION; SUGAR

ORGN Super Taxa
Ascomycetes: Fungi, Plantae; Fungi - Unspecified: Fungi, Plantae; Fungi
Imperfecti or Deuteromycetes: Fungi, Plantae

ORGN Organism Name
fungus (Fungi - Unspecified); Candida shehatae (Fungi Imperfecti or Deuteromycetes); Saccharomyces cerevisiae (Ascomycetes)

ORGN Organism Superterms
fungi; microorganisms; nonvascular plants; plants

RN 50-99-7 (GLUCOSE)
58-86-6Q (XYLOSE)
25990-60-7Q (XYLOSE)
64-17-5 (ETHANOL)
7782-44-7 (OXYGEN)

L9 ANSWER 11 OF 12 CAPLUS COPYRIGHT 2001 ACS
AN 1989:22273 CAPLUS
DN 110:22273
TI Construction of pentose-fermenting strains of Saccharomyces
AU Hollenberg, C. P.
CS Inst. Mikrobiol., Univ. Duesseldorf, Duesseldorf, D-4000, Fed. Rep. Ger.
SO Monogr. - Eur. Brew. Conv. (1987), 12, 199-208
CODEN: MEBCD6; ISSN: 0255-7045
DT Journal
LA English
CC 16-5 (Fermentation and Bioindustrial Chemistry)
Section cross-reference(s): 3
AB The classical organism for ethanol prodn., Saccharomyces cerevisiae, uses hexoses as a major substrate. The latter constitutes 70% of the prodn. price. Only cheaper substrates can have a large impact on the costs of this process. In this paper possibilities will be addressed to develop yeast strains which can ferment carbohydrates that are not fermentable at present by **S. cerevisiae**. As an example, the possibilities to develop a **xylose-fermenting yeast** strain will be described. Xylose is the monomer of xylan, which constitutes about 10-35% of plant biomass. Expts. towards the introduction of the bacterial xylose isomerase (XI) pathway into **S. cerevisiae** are described. The xylose isomerase gene from Bacillus subtilis was isolated and expressed in **S. cerevisiae** under control of the PDC1 promoter. Transformants produced about 2% of the cell protein as the product of the XI gene, but no enzymic activity was detectable. Another approach to introduce the xylose pathway found in some yeasts is discussed.
ST ethanol fermn xylose Saccharomyces gene cloning; Bacillus xylose isomerase gene cloning yeast
IT Fermentation
(ethanol, from xylose by Saccharomyces cerevisiae, gene cloning in)
IT Gene and Genetic element, microbial
RL: BIOL (Biological study)
(for xylose isomerase, of Bacillus subtilis, cloning and expression in Saccharomyces cerevisiae of)
IT Molecular cloning
(of xylose isomerase gene, of Bacillus subtilis, in Saccharomyces cerevisiae)
IT Bacillus subtilis
(xylose isomerase gene of, cloning and expression of, in Saccharomyces cerevisiae)
IT Saccharomyces cerevisiae
(xylose-fermenting, construction of strains of, for ethanol prodn.)
IT 58-86-6, Xylose, biological studies
RL: BIOL (Biological study)
(ethanol from fermn. of, by Saccharomyces cerevisiae, gene cloning in)
IT 9023-82-9, Xylose isomerase
RL: BIOL (Biological study)
(gene for, of Bacillus subtilis, cloning and expression in Saccharomyces cerevisiae of)
IT 64-17-5P, Ethanol, biological studies
RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP (Preparation)
(manuf. of, from xylose by Saccharomyces cerevisiae, gene cloning in)

Examiner's ref.

13 ANSWER 1 OF 1 EUROPATFULL COPYRIGHT 2001 WILA

GRANTED PATENT

AN 527758 EUROPATFULL ED 19980119 EW 199802 FS PS
TIEN RECOMBINANT YEASTS CONTAINING THE DNA SEQUENCES CODING FOR XYLOSE REDUCTASE AND XYLITOL DEHYDROGENASE ENZYMES.
IN HALLBORN, Johan, Vildandsvaegen 2 U: 304, S-222 34 Lund, SE;
PENTTILAe, Merja, Vanha Haemeenkylaentie 5-7 A 7, SF-00390 Helsinki, FI;
OJAMO, Heikki, Kirjurinkuja 3 D 25, SF-02600 Espoo, FI;
WALFRIDSSON, Mats, Aellingavaegen 9 A: 504, S-222 34 Lund, SE;
Airaksinen, Ulla, Lehdokkitie 8 B 26, SF-01300 Vantaa, FI;
KERAeNEN, Sirkka, Rahakamarinkatu 4 B 12, SF-00240 Helsinki, FI;
HAHN-HAeGERDAL, Baerbel, Oestra Martensgatan 5, S-223 61 Lund, SE
PA XYROFIN OY, Kyllikinportti 2, 00240 Helsinki, FI
PAN 1313873
AG Woods, Geoffrey Corlett et al, J.A. KEMP & CO. 14 South Square Gray's Inn, London WC1R 5LX, GB
AGN 48721
OS EPB1998001 EP 0527758 B1 980107
SO Wila-EPS-1998-H02-T1
DT Patent
LA Anmeldung in Englisch; Veroeffentlichung in Englisch
DS R AT; R BE; R CH; R DE; R DK; R ES; R FR; R GB; R GR; R IT; R LI; R LU; R NL; R SE
PIT EPB1 EUROPAEISCHE PATENTSCHRIFT (Internationale Anmeldung)
PI EP 527758 B1 19980107
OD 19930224
AI EP 1991-906996 19910408
PRAI FI 1990-1771 19900406
RLI WO 91-FI103 910408 INTAKZ
WO 9115588 911017 INTPNR
REN Curr Genet, Vol. 18, September 1990, PETER KOETTER et al.: "Isolation and characterization of the Pichia stipitis xylitol dehydrogenase gene, XYL2, and construction of a xylose-utilizing Saccharomyces cerevisiae transformant", see page 493 - page 500. Appl. Biochemistry and Biotechnology, Vol. 26, No. 2, 1990, VINA W. YANG et al.: "Purification and Properties of Xylitol Dehydrogenase from the Xylose- Fermenting Yeast Candida shehatae", see page 197 - page 206, specially the Abstract and the discussion. Journal of Fermentations and Bioengineering, Vol. 67, No. 1, 1989, MANFRED RIZZI et al.: "Purification and Properties of the NAD-Xylitol-Dehydrogenase from the Yeast Pichia stipitis", see page 20 - page 24, see the Abstract. Curr Genet, Vol. 16, 1989, JUTTA HAGEDORN and MICHAEL CIRIACY: "Isolation and characterization of xyl mutants in a xylose-utilizing yeast, Pichia stipitis", see page 27 - page 33, see specially page 32, column 2. Process Biochemistry, 1989, BERNARD ALEXANDER PRIOR et al.: "Fermentation of D- xylose by the Yeasts Candida shehatae and Pichia Stipitis Prospects and Problems", see page 21 - page 32, see specially page 24. Enzyme Microb. Technol., Vol. 12, January 1990, N.W.Y. HO et al.: "Purification, characterization, and amino: terminal sequence of xylose reductase from Candida shehatae", see page 33 - page 39, see especially pages 35-36, Table 2 page 37, Fig. 5 page 38. Appl. Microbiol. Biotechnol., Vol. 29, 1988, MANFRED RIZZI et al.: "Xylose fermentation by yeasts", see page 148 - page 154, see especially discussion page 153, column 2
IC ICM C12N015-53

ICS C12N009-04
CM W1
FA RLI; AG; REN
DETDEN; CLMEN; CLMDE; CLMFR
PGC 41
CLMN 1

[redacted]

11 ANSWER 2 OF 2 USPATFULL
AN 85:22459 USPATFULL
TI Direct fermentation of D-xylose to ethanol by a xylose-fermenting yeast mutant
IN Gong, Cheng-Shung, West Lafayette, IN, United States
PA Purdue Research Foundation, West Lafayette, IN, United States (U.S. corporation)
PI US 4511656 19850416
AI US 1982-376731 19820511 (6)
DCD 20000111
RLI Continuation-in-part of Ser. No. US 1981-263925, filed on 15 May 1981, now patented, Pat. No. US 4368268
DT Utility

| | | | |
|---|---|---|---|
| REP US 1857429 | May 1932 | 435/163.000 | Christensen |
| US 2481263 | Sep 1949 | 435/153.000 | Tsuchiya et al. |
| US 3887434 | Jun 1975 | 435/172.000 | Frommer et al. |
| US 4288550 | Sep 1981 | 435/940.000 | Ishida et al. |
| US 4359534 | Nov 1982 | 435/161.000 | Kurtzman et al. |
| US 4368268 | Jan 1983 | | |

[redacted]

Examiner's ref

L10 ANSWER 2 OF 2 USPATFULL
AN 1999:15739 USPATFULL
TI Xylose utilization by recombinant yeasts
IN Hallborn, Johan, Lund, Sweden
Penttila, Merja, Helsinki, Finland
Ojamo, Heikki, Espoo, Finland
Walfridsson, Mats, Lund, Sweden
Airaksinen, Ulla, Vantaa, Finland
Keranen, Sirkka, Helsinki, Finland
Hahn-Hagerdal, Barbel, Lund, Sweden
PA Xyrofin Oy, Helsinki, Finland (non-U.S. corporation)
PI US 5866382 19990202
AI US 1994-336198 19941103 (8)
RLI Continuation of Ser. No. US 1992-848694, filed on 9 Mar 1992, now abandoned which is a continuation-in-part of Ser. No. US 1990-527775, filed on 24 May 1990, now abandoned
PRAI FI 1990-1771 19900406
DT Utility
REP US 4894338 Jan 1990 435/172.300 Knowles et al.
EP 450430 Oct 1991
DE 4009676 Oct 1991
REN Hallbom et al. (1991) "Xylitol production by recombinant S. cerevisiae" Bio/Technology 9:1090-1095.
Meinander et al (1994) Fed-batch xylitol production with recombinant XYL-1 expressing S:cerevisiae using ethanol as a co-substrate Appl. Microbiol. Biotechnol. 42: 334-339.
Koetter et al (1993) "Yylose fermentation by S. cerevisiae" Appl. Microbiol. Biotechnol. 38:776-783.
Young et al. (1983) Science vol. 222 pp. 778-782.
McKnight (1983) PNAS vol. 80 pp. 4412-4416
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EXNAM Primary Examiner: Chambers, Jasemine C.; Assistant Examiner: Priebe, Scott D.
LREP Birch, Stewart, Kolasch & Birch, LLP
CLMN Number of Claims: 15
ECL Exemplary Claim: 1,9
DRWN 13 Drawing Figure(s); 9 Drawing Page(s)

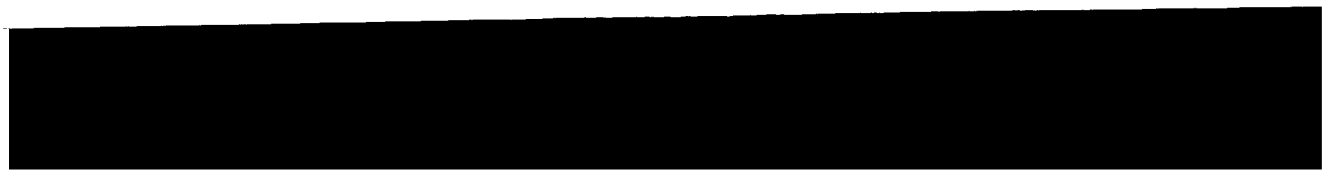
AB This invention relates to recombinant-DNA-technology. Specifically, this invention relates to new recombinant yeast strains transformed with xylose reductase and/or xylitol dehydrogenase enzyme genes. A yeast strain transformed with the xylose reductase gene is capable of reducing xylose to xylitol and consequently of producing xylitol in vivo. If both of these genes are transformed into a yeast strain, the resultant strain is capable of producing ethanol on xylose containing medium during fermentation. Further, the said new yeast strains are capable of expressing the said two enzymes. Xylose reductase produced by these strains can be used in an enzymatic process for the production of xylitol in vitro.

PARN This application is a continuation, application Ser. No. 07/848,694 filed on Mar. 9, 1992, now abandoned, which is a continuation-in-part, of application Ser. No. 07/527,775 filed on May 24, 1990.

SUMM FIELD OF THE INVENTION

This invention relates to recombinant-DNA-technology. Specifically this invention relates to new recombinant yeast strains transformed with xylose reductase and/or xylitol dehydrogenase enzyme genes. A yeast strain transformed with the xylose reductase gene is capable of reducing xylose to xylitol and consequently of producing xylitol in vivo. If both of these genes are transformed into a yeast strain, the resultant strain is capable of producing ethanol on xylose containing medium during fermentation.

Further, the said new yeast strains are capable of expressing the said two enzymes. Xylose reductase produced by these strains can be used in an enzymatic process for the production of xylitol in vitro.



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L3            48 S L1 NOT PY=1998
L4             5 S L3 AND S.CEREVISIAE
L5             0 S XYLOSE FERMENTING S.POMBE
L6             2 S SCHIZOSACCHAROMYCES POMBE(P)XYLOSE FERMENTING

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